

Remarks

Favorable reconsideration of this application, in view of the above amendments and in light of the following remarks and discussion, is respectfully requested.

Claims 1-8 and 13-16 are currently pending in the application; Claims 1-4, 6, 7, and 13-15 having been amended, and new dependent Claim 16 having been added, by way of the present response. Applicants respectfully assert that support for the changes to the claims is self-evident from the originally filed disclosure, including the original claims, and that therefore no new matter has been added.¹

In the outstanding Office Action Claims 1-5 were rejected under 35 U.S.C. § 112, first paragraph; Claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,376,013 to Rangarajan et al. (Rangarajan); Claims 1, 2, 4, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,069,156 to Suzuki in view of U.S. Patent No. 3,297,474 to Shields; Claims 6-8 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan in view of U.S. Patent No. 4,603,813 to Luegering; and Claims 1, 2, 4, 5, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,806,455 to LaBianca in view of U.S. Patent No. 3,920,187 to Willis.

Initially, Applicants express thanks for the Examiner's indication that Claim 14 is allowed. Applicants have amended Claim 14 so as to recite a holder, and to remedy a potential informality. Applicants respectfully assert that Claim 14 remains allowable.

Applicants further express thanks for the Examiner's indication that Claim 3 recite allowable subject matter, such that the claim, although having been objected to would be allowable if rewritten in independent form. In response, Applicants have rewritten Claim 3 to recite features of previously presented independent Claim 1. Applicants have further added

¹ Applicants respectfully assert that support for the changes to the claims is provided, in part, by page 5, lines 14-22; page 12, lines 2-6; and page 16, lines 7-19, of Applicants' originally filed specification.

new dependent Claim 16 depending from Claim 3. Thus, in accordance with the Examiner's indication of allowable subject matter, Applicants respectfully request the allowance of Claims 3 and 16.

As stated above Claims 1-5 were rejected under 35 U.S.C. § 112, first paragraph. In response, Applicants have amended the claims in a non-narrowing manner to remove the recitation of a rod-like state. Thus, Applicants respectfully request that the rejection under 35 U.S.C. § 112, first paragraph, be withdrawn.

As stated above, Claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan. Claims 1, 2, 4, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki in view of Shields. Claims 6-8 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Rangarajan in view of Luegering. Claims 1, 2, 4, 5, and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over LaBianca in view of Willis. Applicants respectfully assert that the amended claims are allowable for the following reasons.

The present invention is directed to an apparatus for forming a coating film. Independent Claim 1 recites a nozzle configured to drop a coating liquid on a surface of a substrate, and gyrating force generation means for giving a gyrating force to the coating liquid such that the coating liquid continues to gyrate after being dropped from the nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle. Independent Claim 2 recites a nozzle configured to drop a coating liquid through a hole on a surface of a substrate, and a spiral groove formed on an inner wall of the hole of the nozzle, the spiral groove extending to a position adjacent an exit of the nozzle and configured to gyrate the coating liquid such that the coating liquid continues to gyrate after being dropped from the nozzle. Independent Claim 6 recites a nozzle configured to drop a coating liquid through a hole on a surface of a substrate, a center rod provided at a center of the hole such

that the coating liquid flows along an inner wall of the hole, the center rod extending to a position adjacent an exit of the nozzle, and a plurality of fins disposed on the center rod and configured to flow the coating liquid in a spiral manner, the plurality of fins extending to a position adjacent the exit of the nozzle. Independent Claim 13 recites a nozzle configured to drop a coating liquid on a surface of a substrate, a gyrating force generator configured to give a gyrating force to the coating liquid such that the coating liquid continues to gyrate after being dropped from the nozzle, the gyrating force generator extending to a position adjacent an exit of the nozzle, and a center rod provided at a center of the hole of the nozzle and configured to flow the coating liquid along an inner wall of the nozzle. Independent Claim 15 recites a nozzle configured to drop a coating liquid through a hole on a surface of a substrate, and a spiral groove formed on an inner wall of the hole of the nozzle, the spiral groove extending to a position adjacent an exit of the nozzle.

With respect to the rejections of independent Claim 1, Rangarajan is directed to multiple nozzles for dispensing resist. As shown in Figure 3, for example, of Rangarajan, a resist and a solvent are received in a mixing chamber 106 of a nozzle 90.

Applicants respectfully assert that Rangarajan does not teach or suggest, however, the claimed features of gyrating force generation means for giving a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle, as recited in independent Claim 1. Specifically, Applicants respectfully assert that Rangarajan does not show or state the mixing chamber 106, for example, adjacent an exit of the nozzle 90. Rather, Rangarajan shows that the mixing chamber 106 is disposed apart from the exit of the nozzle 90.

Applicants respectfully assert that the claimed features recited in independent Claim 1 can provide numerous advantages that cannot be provided by the applied reference. By way

of specific non-limiting examples, Applicants respectfully assert that the claimed features can result in a coating liquid, which has been given a gyrating force, easily extending over an entire surface of a substrate. Further, rotation of the substrate relative to the gyrating coating liquid can result in a reduced cost per substrate as an amount of applied coating liquid is reduced, and can result in precise film thickness control.²

Thus, Applicants respectfully request that the rejection of independent Claim 1 under 35 U.S.C. § 103(a) in view of Rangarajan be withdrawn.

Suzuki is directed to a spin coating apparatus. The Office Action explicitly concedes that Suzuki does not teach or suggest, however, the claimed features of gyrating force generation means for giving a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle, as recited in independent Claim 1.

The Office Action relies on Shields in an attempt to remedy the deficiencies of Suzuki. Applicants respectfully assert that Shields does not remedy these deficiencies, however, for the following reasons.

Shields is directed to a method for spreading viscous masses. As shown in Figure 1, for example, of Shields, a space between an impeller 13 and a mixing chamber housing 15 forms a mixing chamber 12.³

Applicants respectfully assert that Shields does not teach or suggest, however, the claimed features of gyrating force generation means for giving a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle, as recited in independent Claim 1. Specifically, Applicants respectfully assert that Shields does

² Page 5, lines 9-22, of Applicants' originally filed specification.

³ Column 2, lines 15-18.

not show or state the impeller 13, for example, adjacent an exit of a spray head 16. Rather, Shields shows that the impeller 13 is disposed apart from the exit of the spray head 16.

Thus, for the above reasons, Applicants respectfully assert that neither Suzuki nor Shields, whether taken alone or in combination, teaches or suggests the claimed features recited in independent Claim 1. Therefore, Applicants respectfully request that the rejection of independent Claim 1 under 35 U.S.C. § 103(a) in view of Suzuki and Shields be withdrawn.

LaBianca is directed to thermal stabilization of photoresist images. The Office Action explicitly concedes that LaBianca does not teach or suggest, however, the claimed features of gyrating force generation means for giving a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle, as recited in independent Claim 1.

The Office Action relies on Willis in an attempt to remedy the deficiencies of LaBianca. Applicants respectfully assert that Willis does not remedy these deficiencies, however, for the following reasons.

Willis is directed to a spray head. As shown in Figure 1, for example, of Willis, fixed vanes 6 direct an annular sheet of incoming fluid into helical motion.⁴

Applicants respectfully assert that Willis does not teach or suggest, however, the claimed features of gyrating force generation means for giving a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generating means extending to a position adjacent an exit of the nozzle, as recited in independent Claim 1. Specifically, Applicants respectfully assert that Willis does

⁴ Column 2, lines 42-49.

not show or state the fixed vanes 6, for example, adjacent an exit of a spray head 1. Rather, Willis shows that the fixed vanes 6 are disposed apart from the exit of the spray head 1.

Thus, for the above reasons, Applicants respectfully assert that neither LaBianca nor Willis, whether taken alone or in combination, teaches or suggests the claimed features recited in independent Claim 1. Therefore, Applicants respectfully request that the rejection of independent Claim 1 under 35 U.S.C. § 103(a) in view of LaBianca and Willis be withdrawn.

Applicants respectfully assert that the outstanding grounds of rejection of independent Claim 1 have been overcome for the above reasons. Thus, Applicants respectfully request the allowance of independent Claim 1.

Regarding the rejections of independent Claim 2, for reasons similar to those discussed above with respect to independent Claim 1, Applicants respectfully assert that none of Suzuki, Shields, LaBianca, or Willis, whether taken alone or in combination, teaches or suggests the claimed features of a spiral groove extending to a position adjacent an exit of a nozzle and configured to gyrate a coating liquid such that the coating liquid continues to gyrate after being dropped from the nozzle, as recited in Claim 2.

Applicants respectfully assert that the outstanding grounds of rejection of independent Claim 2 have been overcome for the above reasons. Thus, Applicants respectfully request the allowance of independent Claim 2.

Regarding the rejection of independent Claim 6, as discussed above Rangarajan is directed to multiple nozzles dispensing resist. The Office Action explicitly concedes that Rangarajan does not teach or suggest, however, the claimed features of a center rod provided at a center of a hole of a nozzle such that a coating liquid flows along an inner wall of the hole, the center rod extending to a position adjacent an exit of the nozzle, and a plurality of fins disposed on the center rod and configured to flow the coating liquid in a spiral manner,

the plurality of fins extending to a position adjacent the exit of the nozzle, as recited in independent Claim 6.

The Office Action relies on Luegering in an attempt to remedy the deficiencies of Rangarajan. Applicants respectfully assert that Luegering does not remedy these deficiencies, however, for the following reasons.

Luegering is directed to a double back spray nozzle. As shown in Figure 4, for example, of Luegering, a helically configured mixing guide or baffle 32 is positioned within a mixing chamber 30.⁵

Applicants respectfully assert that Luegering does not teach or suggest, however, the claimed features of a center rod provided at a center of a hole of a nozzle such that a coating liquid flows along an inner wall of the hole, the center rod extending to a position adjacent an exit of the nozzle, and a plurality of fins disposed on the center rod and configured to flow the coating liquid in a spiral manner, the plurality of fins extending to a position adjacent the exit of the nozzle, as recited in independent Claim 6. Specifically, Applicants respectfully assert that Luegering does not show or state the mixing guide or baffle 32 extending to a position adjacent an exit of a nozzle 10, for example.

Thus, for the above reasons, Applicants respectfully assert that neither Rangarajan nor Luegering, whether taken alone or in combination, teaches or suggests the claimed features recited in independent Claim 6. Therefore, Applicants respectfully request that the rejection of independent Claim 6 under 35 U.S.C. § 103(a) in view of Rangarajan and Luegering be withdrawn.

Applicants respectfully assert that the outstanding grounds of rejection of independent Claim 6 have been overcome for the above reasons. Thus, Applicants respectfully request the allowance of independent Claim 6.

⁵ Column 4, lines 24-32.

Regarding the rejection of independent Claim 13, for reasons similar to those discussed above with respect to independent Claim 6, Applicants respectfully assert that none of Rangarajan or Luegering, whether taken alone or in combination, teaches or suggests the claimed features of a gyrating force generator configured to give a gyrating force to a coating liquid such that the coating liquid continues to gyrate after being dropped from a nozzle, the gyrating force generator extending to a position adjacent an exit of the nozzle, as recited in Claim 13.

Applicants respectfully assert that the outstanding grounds of rejection of independent Claim 13 have been overcome for the above reasons. Thus, Applicants respectfully request the allowance of independent Claim 13.

Regarding the rejections of independent Claim 15, for reasons similar to those discussed above with respect to independent Claim 1, Applicants respectfully assert that none of Suzuki, Shields, LaBianca, or Willis, whether taken alone or in combination, teaches or suggests the claimed features of a spiral groove extending to a position adjacent an exit of a nozzle, as recited in Claim 15.

Applicants respectfully assert that the outstanding grounds of rejection of independent Claim 15 have been overcome for the above reasons. Thus, Applicants respectfully request the allowance of independent Claim 15.

Claims 4, 5, 7, and 8 are allowable for the same reasons as the independent claims from which they depend, as well as for their own features. Thus, Applicants respectfully request the allowance of dependent Claims 4, 5, 7, and 8.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-8 and 13-16 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

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